## REMARKS

Claims 1-3 are pending in the application.

Claim 1 has been amended in order to more particularly point out, and distinctly claim the subject matter to which the applicant regards as his invention. It is believed that this Amendment is fully responsive to the Office Action dated **September 12, 2002**.

### Drawing Objection

In compliance with the Office request, Figures 1, 2 and 3 have been amended to add prior art labels thereon. Reconsideration and withdrawal of this objection are respectfully requested.

### Claim Rejections under 35 USC §112

Regarding the Office inquiry pertaining to "estimated value", between pages 5, line 26, to page 6, line 4, of the written specification, it has been specifically recited that:

> "The estimating means estimates a magnetic flux or magnetic flux density generated between a surface of the electromagnet and an electromagnetic target on the supported member. An estimated value of the magnetic flux or magnetic flux estimating means is fed back to the power amplifier that supplies a control current to a coil of the supporting electromagnet.
>
> As described above, the magnetic flux or magnetic flux density estimating means is provided, and the magnetic flux or magnetic flux density generated between a surface of the electromagnetic and the electromagnetic target on the supported member is estimated on the basis of the control current detection signal of the current sensor and the displacement detection signal of the displacement sensor. The estimated value is fed back to the power amplifier."

Therefore, the written specification has already made it clear that the estimated value corresponds to one of magnetic flux and magnetic flux density.

Regarding the meaning of the electromagnetic target, as clearly shown in Figure 4 of the present invention, magnetic target 3 is a distance g away from two tip ends of magnetic yoke 5. Therefore, target is merely used to serve as a referencing position. This is readily understood by a person of ordinary skill in the art. Otherwise, from what basis should one use to measure the distance g?

Regarding the 112 first paragraph of 35 U.S.C., it is does not support a lack of possession of the claimed invention rejection. To verify this understanding, the Undersigned has sought for but simply cannot find such a type of rejection from the MPEP. Therefore, this rejection is unsubstantiated by the cited portion of 35 U.S.C. However, should the Office still believe such a ground of rejection is supported by the 35 U.S.C. 112, first paragraph, a citation of where such position is explained in the MPEP is respectfully requested.

Should the Office been contemplating a lack of enablement rejection, MPEP 2164.01 has specifically stated in its entirety that:

> Any analysis of whether a particular claim is supported by the disclosure in an application requires a determination of whether that disclosure, when filed, contained sufficient information regarding the subject matter of the claims as to enable one skilled in the pertinent art to make and use the claimed invention. The standard for determining whether the specification meets the enablement requirement was cast in the Supreme Court decision of *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916) which postured the question: is the experimentation needed to practice the invention undue or unreasonable? That standard is still the one to be applied. *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). Accordingly, even though the statute does not use the term "undue experimentation," it has been interpreted to require that the claimed invention be enabled so that any person skilled

> in the art can make and use the invention without undue experimentation. *In re Wands*, 858 F.2d at 737, 8 USPQ2d at 1404 (Fed. Cir. 1988). See also *United States v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) ("The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation."). A patent need not teach, and preferably omits, what is well known in the art. *In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986), *cert. denied*, 480 U.S. 947 (1987); and *Lindemann Maschinen-fabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1463, 221 USPQ 481, 489 (Fed. Cir. 1984). Determining enablement is a question of law based on underlying factual findings. *In re Vaeck*, 947 F.2d 488, 495, 20 USPQ2d 1438, 1444 (Fed. Cir. 1991); *Atlas Powder Co. v. E.I. du Pont de Nemours & Co.*, 750 F.2d 1569, 1576, 224 USPQ 409, 413 (Fed. Cir. 1984).

Judging from the explanation given in the objection, there is not any enablement problem, because what the Office Action recites as issues of concern does not really question whether the specification contained sufficient information regarding the subject matter of the claims as to enable one skilled in the pertinent art to make and use the claimed invention. The issues of concern can be readily eliminated by a referring to a relevant portion of the written specification and a simple explanation as understood by a person of ordinary skill in the art. Regarding the burden of proving a lack of enablement, MPEP 2164.04 has stated that:

> In order to make a rejection, the examiner has the initial burden to establish a reasonable basis to question the enablement provided for the claimed invention. *In re Wright*, 999 F.2d 1557, 1562, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993) (examiner must provide a reasonable explanation as to why the scope of protection provided by a claim is not adequately enabled by the disclosure). A specification disclosure which contains a teaching of the manner and process of making and using an invention in terms which correspond in scope to those used in describing and defining the subject matter sought to be patented must be taken as being in compliance with the enablement requirement of 35 U.S.C. 112, first paragraph, unless there is a reason to doubt the objective truth of the statements contained therein which must be relied on for enabling support. Assuming that sufficient reason for such doubt exists, a rejection for failure to teach how to make and/or use will be proper on that basis. *In*

*re Marzocchi*, 439 F.2d 220, 224, 169 USPQ 367, 370 (CCPA 1971). As stated by the court, "it is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain why it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement. Otherwise, there would be no need for the applicant to go to the trouble and expense of supporting his presumptively accurate disclosure." 439 F.2d at 224, 169 USPQ at 370. According to *In re Bowen*, 492 F.2d 859, 862-63, 181 USPQ 48, 51 (CCPA 1974), the minimal requirement is for the examiner to give reasons for the uncertainty of the enablement. This standard is applicable even when there is no evidence in the record of operability without undue experimentation beyond the disclosed embodiments. See also *In re Brana*, 51 F.3d 1560, 1566, 34 USPQ2d 1436 ,1441 (Fed. Cir. 1995) (citing *In re Bundy*, 642 F.2d 430, 433, 209 USPQ 48, 51 (CCPA 1981)) (discussed in MPEP ' 2164.07 regarding the relationship of the enablement requirement to the utility requirement of 35 U.S.C. 101). While the analysis and conclusion of a lack of enablement are based on the factors discussed in MPEP ' 2164.01(a) and the evidence as a whole, it is not necessary to discuss each factor in the written enablement rejection. The language should focus on those factors, reasons, and evidence that lead the examiner to conclude that the specification fails to teach how to make and use the claimed invention without undue experimentation, or that the scope of any enablement provided to one skilled in the art is not commensurate with the scope of protection sought by the claims. This can be done by making specific findings of fact, supported by the evidence, and then drawing conclusions based on these findings of fact. For example, doubt may arise about enablement because information is missing about one or more essential parts or relationships between parts which one skilled in the art could not develop without undue experimentation. In such a case, the examiner should specifically identify what information is missing and why one skilled in the art could not supply the information without undue experimentation. See MPEP ' 2164.06(a). References should be supplied if possible to support a *prima facie* case of lack of enablement, but are not always required. *In re Marzocchi*, 439 F.2d 220, 224, 169 USPQ 367, 370 (CCPA 1971). However, specific technical reasons are always required. In accordance with the principles of compact prosecution, if an enablement rejection is appropriate, the first Office Action on the merits should present the best case with all the relevant reasons, issues, and evidence so that all such rejections can be withdrawn if applicant provides appropriate convincing arguments and/or evidence in rebuttal. Providing the best case in the first Office Action will also allow the second Office Action to be made final should applicant fail to provide appropriate convincing arguments and/or evidence. Citing new references and/or expanding arguments in a second Office Action could prevent that Office Action from being made final. The principles of compact prosecution also dictate that if an enablement rejection is appropriate and the examiner recognizes

limitations that would render the claims enabled, the examiner should note such limitations to applicant as early in the prosecution as possible.

In other words, the examiner should always look for enabled, allowable subject matter and communicate to applicant what that subject matter is at the earliest point possible in the prosecution of the application."

Therefore, according to the MPEP, to meet the initial burden to establish a reasonable basis to question the enablement provided for the claimed invention, the Office should:

1. construe the claims and take position on terms that may lend multiple meaning;

2. provide a reasonable explanation as to why the scope of protection provided by a claim is not adequately enabled by the disclosure;

3. explain why the Office doubts the truth or accuracy of any statement in a supporting disclosure;

4. back up assertions of the Office with acceptable evidence or reasoning which is inconsistent with the contested statement; and

5. Give reasons for the uncertainty of the enablement.

Should the Office be unable to meet the requirement of these tests, then the Office has not met its initial burden in asserting a lack of enablement rejection. There would be no need for the applicant to go to the trouble and expense of supporting his presumptively accurate disclosure.

**A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite.**

Independent claim 1 has been amended, as needed, to overcome this rejection. Reconsideration and withdrawal of this rejection are respectfully requested.

**Claim Rejections under 35 USC §102**

Claims 1-3 are rejected under 35 USC §102(e) as being anticipated by Applicant's Prior Art.

In rejecting the claimed invention, the outstanding Office Action has specifically stated that:

> "Applicants Prior Art discloses in Figures 1 and 2 a magnetic hearing apparatus of a control type having a supporting electromagnet (4) that is capable of generating a magnetic force to support a supported member, without contact by a magnetic force generated by supplying a control currant to a coil of the electromagnet (6) from a power amplifier (7). Further including an apparatus comprising of a current sensor (11) for detecting the control current output from the power amplifier (7), a displacement sensor (10) for detecting a displacement of the support member, and a magnetic flux for the estimating means which receives at least a control current detection signal (Si) of the current sensor (11) and a displacement sensor (10), for estimating a magnetic flux generated between a surface of the electromagnet (4) and the electromagnetic target (3) on the supported member. Wherein, an estimated value from the estimating means is fed back to the power amplifier (7)."

The outstanding Office Action has artfully rejected the claimed invention by substantially copying the claim language of the claimed invention and selectively inserted parenthetical supports as to where the same element is disclosed in the admitted prior art. Interestingly, the Applicant never stated that the admitted prior art discloses or teaches a magnetic flux estimating means. Naturally, the prior art also cannot possibly disclose or teach a magnetic flux estimating means which receives at least a control current detection signal of said current sensor and a displacement detection signal

of said displacement sensor for estimating a magnetic flux or a magnetic flux density generated between a surface of said electromagnet and the electromagnetic target on said supported member, wherein an estimated value from said estimating means is fed back to said power amplifier.

However, the outstanding Office Action nevertheless asserted that the admitted prior art has disclosed an estimating means yet without providing any citation as to where this element is disclosed in the admitted prior art.

In contradistinction, the claimed invention is supported by way of an example in Figure 4, where there is indeed disclosed a magnetic bearing apparatus comprising a current sensor 11 for detecting the control current output from a power amplifier 17; a displacement sensor 10 for detecting a displacement g of a support member 1; and a magnetic flux or a magnetic flux density estimating means 20 which receives at least a control current detection signal Si of said current sensor 11 and a displacement detection signal Sg of said displacement sensor 10 for estimating a magnetic flux φ or a magnetic flux density generated between a surface of said electromagnet 4 and the electromagnetic target 3 on a supported member 1, wherein an estimated value from said estimating means is fed back to said power amplifier 7.

It is well settled that:

> "A claim is anticipated only if each and every element *as set forth in the claim* is found, either expressly or inherently described, in a single prior art reference." *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1567, 7 USPQ2d 1057 (Fed. Cir. 1988)."

Should the Office continue to assert that the claimed invention, as amended, is anticipated by the asserted prior art, a citation of where each and every claimed feature, either as column number and line number, or figure number and reference numeral, or a combination thereof, as disclosed in the asserted prior art is respectfully requested.

Should the Office determine that any claimed feature is not disclosed in the asserted prior art, it is respectfully submitted that the claimed invention is thereby not anticipated by the asserted prior art. Allowance of the claimed invention is then respectfully requested.

It is respectfully submitted that the claimed invention, as amended, patentably distinguishes over the asserted prior art. Claims dependent thereon, by virtue of inherency, also patentably distinguish over the asserted prior art. Reconsideration and withdrawal of this rejection are respectfully requested.

As an effort to assist the Office to determine whether indeed each and every element of the claimed invention is disclosed in the prior art, the following claims with parenthetical blanks are submitted herewith.

1. (Amended)A magnetic bearing apparatus comprising:

a current sensor (            )for detecting the control current output from a power amplifier (            );

a displacement sensor (            )for detecting a displacement of [said] a support member; and

a magnetic flux or a magnetic flux density estimating means ( ) which receives at least a control current detection signal ( ) of said current sensor ( ) and a displacement detection signal of said displacement sensor for estimating ( ) a magnetic flux ( ) or a magnetic flux density ( ) generated between a surface of said electromagnet ( ) and the electromagnetic target ( ) on a supported member ( ), wherein an estimated value ( ) from said estimating means ( ) is fed back to said power amplifier ( ).

## Conclusion

In view of the aforementioned amendments and accompanying remarks, claim 1, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

Attached hereto is a marked-up version of the changes made to the drawings, specification, claim 1 and Abstract by the current amendment. The attached page is captioned "**Version with markings to show changes made**."

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,
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PATENT TRADEMARK OFFICE

Enclosures: Version with markings to show changes made
Request for Approval of Drawing Corrections w/Figs. 1-3 marked in red ink

**VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/912,338**

**IN THE DRAWINGS:**

Please amend Figures 1, 2 and 3 as indicated in the attached Request for Approval of Drawing Changes.

**IN THE SPECIFICATION:**

**Page 2, paragraph starting at line 19 has been amended as indicated below:**

From the displacement detection signal Sg and a target command signal [$e_O$] $\underline{\theta_0}$, a target position of the supported object 1 is obtained. A compensator 8 is provided with a control rule for positioning the supported object at the target position without any contact, and the output of the compensator 8 is a control command signal S1. The control command signal S1 is input to a power amplifier 7, and a control current i following-up to the control command signal S1 is supplied to an electromagnet coil 6 of the electromagnet 4. At this time, the coil load of the electromagnet 4 is a delay load, so that the electromagnet 4 cannot follow the input signal. To improve the delay characteristics, the control current i of the electromagnet coil 6 is detected by a current sensor 11 to perform local feedback. That is, a control current detection signal Si detected by the current sensor 11 is fed back (negative feedback) to the input of the power amplifier 7 through a regulator 12.

**Page 6, paragraph starting at line 23, has been amended as indicated below:**

Preferably, a control current detection signal of the current sensor is fed back to the power amplifier. This results in an addition, to a magnetic bearing apparatus according to the present invention, of a conventional [current] voltage feedback type power amplifier system in which a control current detection signal of the current sensor is fed back to the power amplifier. Consequently, an industrial reliability can be improved.

**Page 7, paragraph starting at line 29 and bridging over to page 8, has been amended as indicated below:**

Hereinafter, preferred embodiments of the present invention will be described in more detail with reference to the accompanying drawings. Fig. 4 is a diagram showing a structural example of a magnetic bearing apparatus in accordance with the present invention. In the magnetic bearing apparatus shown in Fig. 4, a displacement sensor 10 and an electromagnet 4 are disposed facing to a sensor target 2 and an electromagnetic target 3 of a supported member 1, respectively. The displacement sensor 10 is connected to a displacement sensor amplifier 9 and outputs a displacement detection signal Sg indicative of a gap length g between the displacement sensor 10 and the sensor target 2. A target position of the supported member 1 is given based on a displacement detection signal Sg and a target command signal [$E_O$] $\underline{\theta_0}$. A control command signal S1 is outputted to a power amplifier 7 from a compensator 8.

**Page 8, paragraph starting at line 25 and bridging over to page 9, has been amended as indicated below:**

Fig. 5 is a diagram for explaining a magnetic circuit of the electromagnet. The figure shows an example of a magnetic circuit that can ignore a leak magnetic flux. In the figure, a dotted line L denotes an average magnetic path. If there is no leak magnetic flux, the magnetic flux density B is represented by the following:

$$B=iN/\{(2g/\mu_O)+(1_m/\mu_O\mu_{S1})+(1_n/\mu_O\mu_{S2})\}\ [T] \quad (1)$$

If

$$(1_m/\mu_O\mu_{S1})+(1_n/\mu_O\mu_{S2})<<(2g/\mu_O) \quad (2)$$

then,

$$B\fallingdotseq(\mu_O iN)/(2g)\ [T] \quad (3)$$

where N denotes the number of turns of the electromagnetic coil; A a cross-sectional area of the electromagnetic yoke; [I] i a current of an electromagnetic coil 6; g a gap between an end surface of the electromagnetic yoke and the electromagnetic target; $1_m$ an average magnetic path length on the electromagnetic yoke side; $1_n$ an average magnetic path length on the electromagnetic target side; B the magnetic flux density; φ the magnetic flux ($\varphi=B\cdot A$); $\mu_O$ the vacuum magnetic permeability (the same in the atmosphere); $\mu s_1$ the specific magnetic permeability on the electromagnetic yoke; and $\mu_{S2}$ the specific magnetic permeability on the electromagnetic target.

**Page 9, paragraph starting at line 10, has been amended as indicated below:**

Since no leak magnetic flux exists in the electromagnetic yoke 5 having the sectional area A, the magnetic flux $\varphi$ at the gap g between the end surface of the electromagnetic yoke 5 and the surface of the electromagnetic target 3 is equal to a product of the magnetic flux density B and the sectional area A. The equation (1) represents a relationship between the magnetic flux density and other parameters. The specific magnetic permeability [$\mu_{S1}$] $\underline{\mu_{S2}}$ of the electromagnetic yoke and the <u>specific</u> magnetic permeability $\mu_{S2}$ of the electromagnetic target are variables of the intensity H of the magnetic flux density or magnetic field and the frequency thereof. Conventionally, there are a variety of applications where it is sufficient that those values are considered as constants. If these values cannot be ignored, the magnetic <u>flux</u> feedback type power amplifier structured as shown in Fig. 3 has been adopted.

**Page 10, paragraph starting at line 12, has been amended as indicated below:**

A phase delay transfer function [of the coil current] of the electromagnetic coil current and the magnetic flux $\phi$ and the magnetic flux density B can be represented by a transfer function equations of low pass filters shown in Figs. 7(a) and 7(b). Such a transfer function can be obtained by curve-fitting actual data and making a calculation of an equation, or can be simulated by a simple analog circuit. Fig. 7(a) shows the structure of a low pass filter using passive elements, and Fig. 7(b) shows the structure of a low pass filter using an operational amplifier.

**Page 10, paragraph starting at line 23 and bridging over to page 11, has been amended as indicated below:**

Fig. 8 is a diagram showing a structural example of the estimator 20. The following equations can be obtained from the relationship of the above equations (1) and (3):

$$B=K(i/g)f \quad (4)$$

$$\varphi=BA \quad (5)$$

where K is a gain constant defined by the number of turns of the electromagnetic coil 6, an adjustment gain and the like; and f is a characteristic of a simulator that simulates the delay characteristic by a method shown in Fig. 6. If at least the coil current i (the control current detection signal Si of the current sensor 11) and the gap <u>length</u> g between the end surface of the electromagnet yoke 5 and the electromagnet target 3 (the displacement detection signal Sg of the displacement sensor 10) are inputted to the simulator, it is possible to obtain a signal corresponding to the magnetic flux density B. Further, since the magnetic flux φ and the magnetic flux density B exhibit a relationship as indicated by equation (5), a signal corresponding to the magnetic flux φ can be obtained, if the sectional area A is included in the gain constant K.

**Page 12, paragraph starting at line 19, has been amended as indicated below:**

As will be understood from the description made above, the present invention is capable of bringing about various advantages. According to the present invention, since the magnetic flux density estimating means is provided for estimating a magnetic flux or a magnetic flux density generated between a surface of the electromagnet on the supporting side and the electromagnetic target on the supported member[. The], the estimated value is fed back to the power amplifier. Consequently, an improvement can be achieved, as in the magnetic flux feedback power amplifier, taking into consideration, in addition to a coil load of an electromagnet coil, transfer characteristics of a current flowing through the electromagnetic coil and generated magnetic fluxes due to characteristics of magnetic materials forming the electromagnetic yoke of the electromagnet and the electromagnetic target. Further, since the magnetic flux density estimating means is disposed within the controller, the number of signal lines within the cable is not increased.

## IN THE CLAIMS:

Please amend claim 1 as follows:

1. (Amended)A magnetic bearing apparatus [of a control type having a supporting electromagnet capable of generating a magnetic force to support a supported member without contact by the magnetic force generated by supplying a control current to a coil of the electromagnet from a power amplifier, said apparatus] comprising:

a current sensor for detecting the control current output from [said] a power amplifier;

a displacement sensor for detecting a displacement of [said support] a supported member; and

a magnetic flux or a magnetic flux density estimating means which receives at least a control current detection signal of said current sensor and a displacement detection signal of said displacement sensor for estimating a magnetic flux or a magnetic flux density generated between a surface of said electromagnet and the electromagnetic target on [said] a supported member, wherein an estimated value from said estimating means is fed back to said power amplifier.

**IN THE ABSTRACT:**

The Abstract has been amended as indicated below:

MAGNETIC BEARING APPARATUS

ABSTRACT OF THE DISCLOSURE

There is provided a magnetic bearing apparatus having no necessity of providing a magnetic flux sensor in the vicinity of a supporting electromagnet and no necessity of increasing the number of signal lines in a cable and capable of achieving an advantage similar to a conventional magnet flux feedback type power amplifier in a controller. The magnetic bearing apparatus for supporting a supported member (1) by a magnetic force without contact comprises a current sensor (11) for detecting a control current output from a power amplifier (7) and a displacement sensor (10) for

detecting a displacement of the supported member (1). A control current detection signal Si of the current sensor (11) and a displacement detection signal Sg of the displacement sensor (10) are supplied to an estimator (20) that estimates a magnetic flux or magnetic flux density generated between a surface of the electromagnet (4) and an electromagnetic target (3) on the supported member (1). An estimated value is fed back from the estimator (20) to the power amplifier (7) that supplies a control current i to an electromagnetic coil (6).